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BOTANY.

Ripening of Fleshy Fruits. — Mr. C. Gerber contributes a paper of 280 pages on this subject to *Ann. d. Sci. Nat. Bot.*, 8th ser., tome iv, nos. 1–6, 2 pl. He studied the behavior of many fruits, — apples, pears, peaches, plums, grapes, oranges, lemons, melons, medlars, loquats, persimmons, bananas, etc. In the space of a short review it is possible to mention only a few of the many interesting facts set forth. Some of the changes which take place in the ripening of fruits are :

(1) The acids, malic, tartaric, citric, are partially used up in the formation of carbohydrates.

(2) The tannin disappears by complete oxidation, without forming any carbohydrates.

(3) The starch is transformed into sugar.

(4) The saccharine substances partly disappear by oxidation.

Mr. Gerber finds that the odors of certain fruits are due to the asphyxiation of the cells, alcohols and volatile acids (acetic, formic, etc.) being formed and these uniting to form agreeable ethers. The asphyxiation of the ripening fruits is due to the development of pectin, which swells, closes up the intercellular spaces, and shuts out the air. If the fruits are then kept at a sufficiently high temperature, so that the life processes of the cells go on rapidly, more oxygen is necessary than can filter through the swollen tissues and that in the sugar is drawn upon, but only after the tannin has entirely disappeared, *i.e.*, the sugar is broken down with the formation of acids and alcohols (and subsequently of ethers) and the liberation of carbon dioxide. At lower temperatures the cells of the fruits are able to get the small amount of oxygen required for their life processes from the air, and consequently no volatile acids, alcohols, or ethers are formed. This is why such fruits as persimmons and bananas are destitute of odor when ripened in cool places. The facts of respiration are as follows :

(1) Sweet fleshy fruits in certain phases of their development liberate in a given time a volume of carbon dioxide greater than the oxygen absorbed, so that the respiratory quotient $\left(\frac{CO_2}{O}\right)$ is greater than unity.

(2) This special respiratory quotient has a different origin and progress, according to the stage of ripening and the chemical principles in the fruits. Two kinds of quotients superior to unity are

distinguishable, one due to the presence of acids, the other to the lack of air and the resultant production of alcohol.

(3) The quotients of acids occur whenever fruits containing these acids (citric, tartaric, malic, etc.) are exposed to a sufficiently high temperature,—30° C. and upwards for fruits containing citric and tartaric acid, 15° C. and upwards for fruits containing malic acid. Quotients of acids are also found in fatty plants.

(4) The quotients of fermentation are produced whenever the oxygen of the air fails to reach the cells in sufficient quantity to furnish the energy necessary for vital activity.

(5) The quotient of fermentation differs from the quotient of acids in the following ways:

(*a*) By the time it appears,—end of maturity.

(*b*) By the lower temperature at which it can take place,—even at 0° C. in case of some fruits.

(*c*) By its value,—often above 3, while that of acids is always below 2 and generally less than 1.5.

(*d*) By the corresponding respiratory intensity,—the amount of oxygen absorbed after the quotient of fermentation appears is much less than before, while the quantity of oxygen absorbed after the quotient of acids appears is much greater than before.

(*e*) By the change which takes place when sections are made,—sectioning slightly diminishes the quotient of respiration and scarcely increases the corresponding respiratory intensity, while it considerably raises the quotient of acids and at the same time greatly increases the respiratory intensity.

Since the acids and tannins disappear rapidly at high temperatures, the ripening of sweet fleshy fruits containing acids (apples, grapes, oranges) or tannins (persimmons) or a mixture of acids and tannins (sorbs, medlars, pears) may be hastened by exposure to warmth. The ripening of fruits containing much acid and not subject to fermentation due to asphyxiation (certain apples, grapes, cherries, oranges, etc.) may be retarded by exposing them to temperatures approaching 0° C., since at low temperatures the acids are not oxidized. On the contrary, fruits containing tannin, and which present at the close of ripening a quotient of fermentation (sorbs, medlars, persimmons, bananas), cannot be preserved much longer at low temperatures than at high ones, since the tannin is oxydized as well at one temperature as at another, and immediately after its disappearance the pectose is transformed into pectin, oxygen is excluded, the period of fermentation sets in, and the fruit softens. Finally, the need of a high temperature for the combustion of tartaric and citric acid and the possibility of the oxidation of malic acid at lower temperatures explains why apples, sorbs, medlars, and other fruits which contain malic acid are able to ripen in cold climates, while grapes and oranges require warmer climates. It also explains why fruits containing malic acid ripen in cool places after picking, while grapes, and especially oranges and other citrus fruits, do so only imperfectly. However, by raising the temperature, fruits containing citric and tartaric acid will ripen in the fruit house.

E. F. S.

Ferns of Nicaragua. — An attractive-looking piece of work bearing the above title forms the second paper in the *Bulletin from the Laboratories of the State University of Iowa*, vol. iv, No. 2, pp. 116–224. The author of the paper is the well-known zoologist Mr. B. Shimek, who collected these plants on the island of Ometépe in Lake Nicaragua and in a narrow strip of country along the San Juan River. Over 120 species of ferns were collected in this small area in less than four months devoted to general botanical work. Judging from Mr. Shimek's statements, the fern flora of Nicaragua appears to be even richer in species than that of New Zealand, but the individuals are not so numerous. Only about one-fifth of the species listed by Mr. Shimek occur in Fournier's list of 121 Nicaragua ferns, and only about two-fifths in Mr. Helmsley's list of 135 species. Much of the territory is still only very imperfectly explored. The paper contains some interesting general remarks on tropical ferns, a key to the orders and families, and a list of the species collected, including helpful notes and a citation of books in which descriptions may be found. Several species are transposed into other genera, and one new species is described, — *Polypodium macbridense.* The text is supplemented by twenty well-executed half-tone plates.

E. F. S.

Pharmaceutical Archives. — With the beginning of the current year, owing to the large amount of original matter offered for the columns of the *Pharmaceutical Review*, the journal has been relieved of much of this matter by the starting under the same management of a second journal under the heading given above. The first number contains articles on the comparative structure of the leaves of *Datura stramonium*, *Atropa belladonna*, and *Hyoscyamus niger*, the popular names of Brazilian plants and their products, a chemical bibliography of morphine, and a study of the structure of the twigs